BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images may include (but are not limited to):

- BLACK BORDERS
- TEXT CUT OFF AT TOP, BOTTOM OR SIDES
- FADED TEXT
- ILLEGIBLE TEXT
- SKEWED/SLANTED IMAGES
- COLORED PHOTOS
- BLACK OR VERY BLACK AND WHITE DARK PHOTOS
- GRAY SCALE DOCUMENTS

IMAGES ARE BEST AVAILABLE COPY.

As rescanning documents *will not* correct images, please do not report the images to the Image Problem Mailbox.

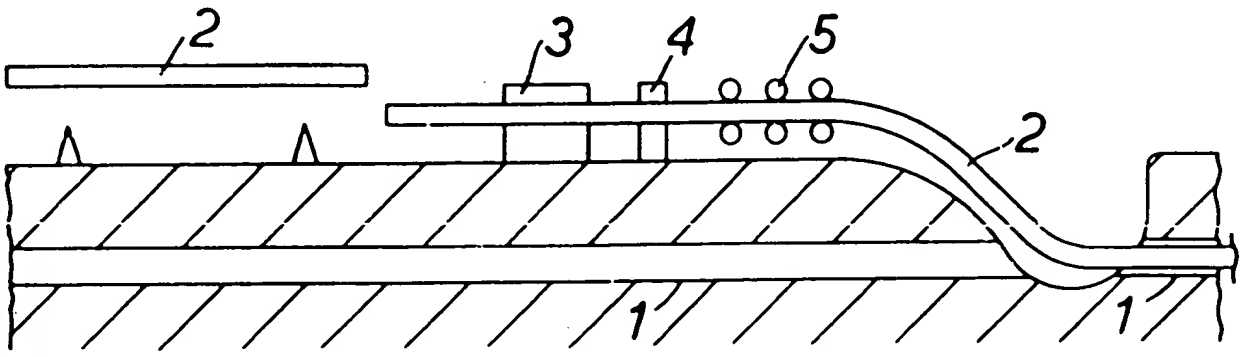
(12) UK Patent Application (19) GB (11) 2 084 686 A

(21) Application No 8030942
(22) Date of filing 25 Sep 1980
(43) Application published
15 Apr 1982
(51) INT CL³
F16L 1/00
(52) Domestic classification
F2P 1A34 1B5D 1B7 2A5
32 3
(56) Documents cited
GB 2018384A
GB 2003576A
GB 1553408
GB 1292689
EP 0000576A
(58) Field of search
E1C
E1F
F2P
H2C
(71) Applicants
British Steel Corporation,
33 Grosvenor Place,
London SW1X 7JG.
(72) Inventors
Samuel Muir
(74) Agents
P.W.M. Heath,
British Steel Corporation,
Patent Section,
33 Grosvenor Place,
London SW1X 7JG.

(54) **Lining pipework**

(57) A method of lining pipework 1 e.g. sewers, water or gas mains comprises butt-welding together a succession of polyolefine pipes 2 of outside diameter greater than the internal diameter of the pipework 1, roll reducing the welded polyolefine pipes 2 to an outside diameter less than the internal diameter of the pipework 1, feeding the welded polyolefine pipes 2 into the pipework 1, and treating e.g. using heated air or a pig (Figure 2 not shown) with a heater, the welded polyolefine pipes 2 within the pipework 1 to cause their reversion expansion into engagement with the internal walls of the pipework 1.

FIG. 1.



GB 2 084 686 A

The drawings originally filed were informal and the print here reproduced is taken from a later filed formal copy.

FIG.1.

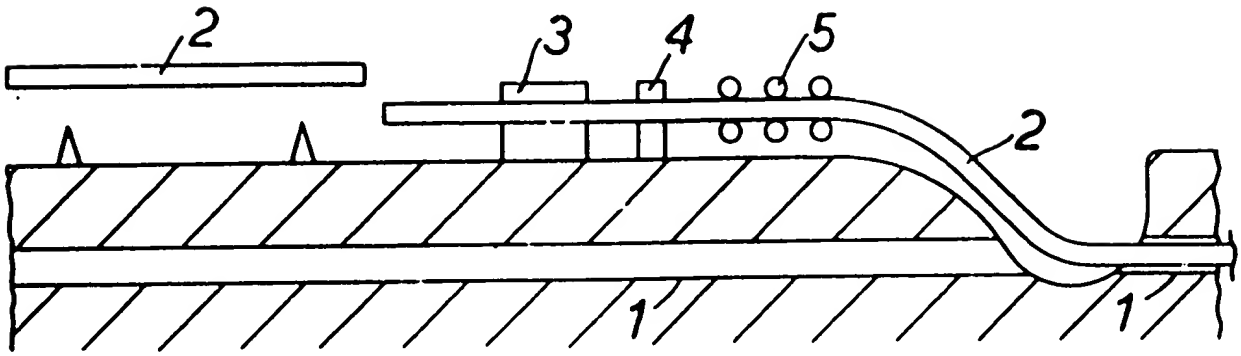
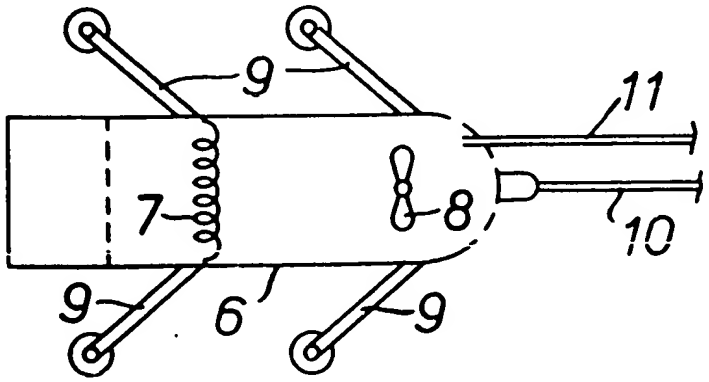


FIG.2.



SPECIFICATION

Improvements in or relating to methods of lining pipework

This invention relates to methods for lining pipework and more particularly to methods for repairing or relining installed pipework of restricted access, such as underground sewer pipes, water mains or gas mains.

Such pipes from time to time require repairing because of damage thereto by any of a number of factors such as changes in differential pressures internally and externally of the pipe, corrosion or erosion of the pipework, or earth movements. Leaks from or into pipework arising from causes such as these must be remedied, and this can be done by repairing or replacing the pipework itself. This, however, can be difficult and costly in time and money if carried out by excavating, uncoupling, replacing and backfilling the pipework, and an alternative solution to this problem is that of providing an internal lining to the pipework to remedy leakage problems.

It is an object of the present invention to provide an improved method of lining pipework.

According to the invention there is provided a method of lining pipework comprising butt-welding together a succession of polyolefine pipes of outside diameter greater than the internal diameter of the pipework, roll reducing the welded polyolefine pipes to an outside diameter less than the internal diameter of the pipework, feeding the welded polyolefine pipes into the pipework, and treating the welded polyolefine pipes within the pipework to cause their reversion expansion into engagement with the internal walls of the pipework.

Choice of the relative dimensions of the polyolefine pipes before and after roll reducing in relation to the dimensions of the pipework will involve consideration of the physical properties of the polyolefine pipes concerned. Thus factors to be taken into account are the ability of the pipes to withstand rolling, the strength of the pipes after roll reducing, and the pipes' reversion expansion characteristics under heating of a magnitude attainable within the pipework.

The polyolefine pipes may be formed of polyethylene and may be roll reduced some 20% in outside diameter before being fed into pipework which is some 10% or less in internal diameter than the original outside diameter of the polyethylene pipes. Treating the pipes within the pipework may be by heating. Thus heating may be provided to produce a progressive localised temperature within pipes in the pipework of between 100 - 120°C so as to produce a reversion expansion to some 90% or more of the original outside diameter of the polyethylene pipes, thereby ensuring full engagement with the internal walls of the pipework leaving very little cavity between the polyethylene pipes and the pipework.

Alternatively or in addition the pipes may for example be treated in the pipework by applying superatmospheric internal pressure thereby causing reversion expansion.

The invention is based upon our appreciation that polyolefine bodies, after physical working, tend to revert to their original configuration particularly under the action of heat or mechanical assistance.

The invention is especially, although not exclusively, applicable to the repair of fractured sewer pipes. Such fractured pipes involve considerable disadvantageous problems. Thus storm or ground water may enter the sewer pipework through the fracture and considerably increase the volume of liquid carried to the sewage works, and in some cases the number and magnitude of such fractures in sewer pipework can be such that sewage works are severely overloaded in storm conditions. Again water infiltration carrying with it soil from the surrounding area can and does lead to the collapse of surrounding ground with possible damage to adjoining property and services. By ensuring a tight fitting lining to fractured sewage pipework, not only is the infiltration of surface water into the lined pipe avoided, but also the seepage of such water along any cavity between the lining and the pipework is effectively prevented.

Heating of the welded pipes within the pipework to attain reversion expansion may be provided by any convenient means, and in one embodiment is provided by means of a "pig" drawn through the pipes and carrying heating means such as an electric fan heater.

Roll reducing of the polyethylene pipes may be provided by a roll stand of the general kind commonly used in the roll reducing for example of steel tubes. To assist the pipes to withstand the rolling action a floating mandrel may be carried within the pipes at the rolling position.

The reducing rolls may be driven or idle or a combination of driven and idle rolls.

In order that the invention may be more readily understood one embodiment thereof will now be described by way of example with reference to the accompanying drawings in which:-

Figure 1 is a schematic representation of on-site apparatus for performing the method of the present invention; and

Figure 2 is a schematic representation of local heating means for use in pipes within the pipework.

Figure 1 illustrates the apparatus or equipment needed for the provision of a repair lining to sewer pipework. It will be seen that a cavity has been dug, at the site of a manhole entrance, to the sewer pipework 1 below ground level. Although not shown, a similar cavity will be dug at an adjacent manhole perhaps some 50 metres distant.

Adjacent the cavity is provided a stock of polyethylene pipe 2 which is fed successively to a welding station 3 where adjoining ends of succeeding pipes are butt-welded together. The now continuous length of welded pipe is passed through a cutting station 4 for removing the internal and external weld bead and then through a succession of reduction rollers 5 which reduce the diameter of the continuous length of polyethylene pipe by approximately 20%. After passing through the reduction roller the pipe is then fed down into the cavity

possibly via guides (not shown) and into the sewer pipework until its leading end reaches the similar cavity previously mentioned at the next adjacent manhole.

After feeding a continuous strand of welded pipes through the section of pipework to be relined (the strand being longer than the pipework length to accommodate contraction on subsequent treating) a heating device or pig as shown in Figure 2 is drawn through the polyethylene pipes.

As can be seen, the pig comprises a hollow body 6 carrying electric heating elements 7 and a fan 8 so as to constituted a powerful fan heater capable of bowing a strong blast of heated air onto the adjacent inner surface of the polyethylene pipes. The pig is carried within the pipes by means of spring-urged legs 9 extending from its hollow body and drawn through the pipes by a cable 10 adjacent to a power supply line 11. In some instances it may be desirable, simultaneously with drawing the pig through the polyethylene pipes, to pass heated air through the length of the pipes from the surface.

The arrangement is such that as the pig is drawn through the pipes localised sequential heating of portions of the pipes occur up to approximately 115°C. This causes sequential reversion expansion along the pipes so that they are caused to bear tightly against the inner wall of the sewer pipework. At the same time, of course, the strand of polyethylene pipes reduces in length so as to coincide with the length of pipework undergoing repair.

With sewer pipework of internal diameter of about 80 to 90 mm, polyethylene pipe of initial outside diameter of about 90 to 100 mm and wall thickness 5 to 15 mm can conveniently be used.

CLAIMS

1. A method of lining pipework comprising butt-welding together a succession of polyolefine pipes of outside diameter greater than the internal diameter of the pipework, roll reducing the welded polyolefine pipes to an outside diameter less than the internal diameter of the pipework, feeding the welded polyolefine pipes into the pipework, and treating the welded polyolefine pipes within the pipework to cause their reversion expansion into engagement with the internal walls of the pipework.

2. A method according to Claim 1 wherein the polyolefine pipes are formed of polyethylene.

3. A method according to Claim 1 of 2 wherein the pipes are of the order of 10% greater outside diameter than the internal diameter of the pipework, and are roll reduced by approximately 20% of their outside diameter.

4. A method according to any one of the preceding claims wherein the pipes within the pipework are treated by heating.

5. A method according to Claim 4 wherein heating is provided for the pipes within the pipework to produce a progressive localised temperature of between 100 to 120°C in the pipe walls whereby to produce a reversion expansion to at least 90% or more of the original outside diameter of the polyethylene pipes.

6. A method according to Claim 4 or 5 wherein the heating is provided by means of a pig drawn through the pipes and carrying heating means.

7. A method according to any one of the preceding claims wherein the pipes are treated within the pipework by applying super-atmospheric internal pressure therein.

8. A method according to any one of the preceding claims wherein roll reducing is provided by a roll stand of the general kind commonly used in the roll reducing for example of steel tubes.

9. A method according to Claim 8 wherein a floating mandrel is carried within the pipes at the rolling position.

10. A method according to Claim 8 or 9 wherein the reducing rolls are a combination of driven and idle rolls.

11. A method of lining pipework substantially as hereinbefore described with reference to the accompanying drawing.

Printed for Her Majesty's Stationery Office, by Croydon Printing Company Limited, Croydon, Surrey, 1982.
Published by The Patent Office, 25 Southampton Building..., London, WC2A 1AY, from which copies may be obtained